and is well worthy of a place in the series in which it is published.

The monograph has, therefore, a double interest. It makes known to us an important coral fauna, and the descriptions are arranged on a scheme which has all the attractiveness of daring and revolutionary change. The authoress distributes the Stramberg corals among 128 species and 41 genera, which are grouped into nine families. And it is by the constitution of these families that Miss Ogilvie's classification will be judged.

The first family is the Amphiastræidæ, of which the typical genus *Amphiastræa* was founded by Étallon for a Kimmeridgian coral that presents some points of resemblance to the Rugosa. Koby has described a series of Jurassic genera allied to *Amphiastræa.* He placed them in the Rugosa, but made no attempt to formulate a definite family for their reception. Miss Ogilvie has now taken this step, which will probably receive unanimous approval, although whether all the eleven genera are correctly assigned to it is open to doubt. Let us take, for example, the genus *Dendrogyra*, of which the type species is the recent West Indian coral *D. cylindrus*, Ehr. We fail to see in that coral any of the primitive characters of *Amphiastræa. Dendrogyra* has a columella, and the corallites are separated by bands of exotheca. The new species which Miss Ogilvie refers to *Dendrogyra* has no exotheca separating the corallites, and there is no columella shown in the figures (Pl. xvi. Fig. 3, 3*a*, 4, 4*a*), although "eine Art von Saulchen" is mentioned in the description. Miss Ogilvie remarks the near affinity of *Dendrogyra* and *Euphyllia;* and if those genera be closely related to her *D. sinuosa*, then we can only conclude that the fossil is no special ally of *Amphiastræa.*

The next family is the Turbinolidæ, represented by the genera *Epismilia* and *Pleurosmilia.* Of the former Miss Ogilvie has seen six Stramberg specimens, which are referred to three species. Both the genera are transferred to the Turbinolidæ from the very original view, that a diminished development of endotheca goes on *pari passu* with a stronger development of "wall." Miss Ogilvie retains throughout von Heider's terms Eutheca and Pseudotheca, and this family illustrates the difficulties they occasion; thus it is stated (p. 134) that the subfamily Trochosmilinæ have "æchte theca vorhanden," whereas *Epismilia*, the second genus placed in it, is stated (p. 141) to have a "Pseudotheka." The retention of *Epismilia* is a step of doubtful value, for there seems good reason to regard the genus as founded only on a worn, weathered *Montlivaltia.* But according to Miss Ogilvie's scheme *Epismilia* and *Montlivaltia* are placed far apart, and separated, in fact, by four families. One of the intermediate families is the Pocilloporidæ, the most novel feature in which is the inclusion there of the genus *Stephanocœnia. Pocillopora* has well developed tabuli, rudimentary septa, no pali, and massive cœnenchyma. *Stephanocœnia*, on the other hand, has no tabuli, well-developed septa, exceptionally distinct pali, and there is often no cœnenchyma or exotheca between the corallites. Miss Ogilvie may perhaps be using the name *Stephanocœnia* in some new sense; for she elsewhere remarks, "it is doubtful whether they [*Astrocœnia* and *Stephanocœnia*] are represented in recent seas" (*Phil. Trans.*, vol. 187, p. 307). But *Stephanocœnia* was founded on the common living West Indian coral *S. intersepta.*

The next family is the Madreporidæ represented only by *Thamnaræa.* In the corals of that genus the septa are palisades of irregular, separate, vertical rods, connected by horizontal, synapticular platforms. Miss Ogilvie describes the septa of Madreporidæ as "bilaterally or radially arranged, compact; sometimes represented by a series of horizontal spines projecting inwards from the wall." If *Thamnaræa* is to be retained in the Madreporidæ the family characters must be changed. *Thamnaræa* appears to represent one of the extreme types of the septal structure seen in the genus *Microsolena,* which Miss Ogilvie leaves in the Fungidæ. To separate *Thamnaræa* from *Microsolena*, and ally it to the compact-septumed *Madrepora* is one of the changes which prejudices the principles upon which the proposal is based.

It may be objected that these criticisms are mere details. But it is by such details that works as the present can best be tested. There is no need here to rediscuss the principles, as that has been previously done by Bourne and Bernard. The value of the present work is that it gives us a chance of examining the results to which the principles lead. Although the results may not all be accepted, students of the Madreporaria will be grateful to Miss Ogilvie for this solid addition to the mass of knowledge of Mesozoic corals. Her reshuffling of the genera is useful and suggestive, for it brings together corals usually placed at the opposite ends of the group, and renders necessary the close comparison of genera which otherwise no one would have thought of comparing. Thus the work is of value not only as the description of many new and interesting corals, but as it leads to the re-examination of forms previously known from a fresh point of view, a labour which is always profitable. J. W. GREGORY.

UNIVERSITY EDUCATION.[1]

THE Johns Hopkins University, which has done me the honour to ask me to say a few words on this occasion, is, although already distinguished, a new and young university. I can remember well its beginning, and as Dr. Gilman has hinted, I may claim to have taken some small part in its birth. When I moved in 1870 from London to Cambridge, I took with me a bright lad of whose ability and industry I had already taken notice. At Cambridge he became my right-hand man, and I had some hopes that I should long have his help; but President Gilman appeared upon the scene, and his influence was so strong that I felt that my own interests were not to be considered, and that I ought to send that favourite across the waters to occupy the first chair of Biology in this new university. Although the memories of him whom I need scarcely name, Henry Newell Martin, are tinged with melancholy, still I feel that this university must always look back with pride and affection on the work which he has done in this country, and in this affection and pride I claim a small share for myself.

Your university is a new one. I come from a very old one; one which was founded six hundred years ago, which has lived through all those centuries, and which, though it has some of the charms, has also some of the evils of antiquity. The traditions of the past weigh heavy upon us. When we attempt to stretch our limbs to meet the new needs of new times we find some old written law, some well-established prejudice, some vested interest preventing our full development. You are a new university; and although I have purposely refrained from refreshing my mind as to the exact status of your regulations, and as to how far you may have already entangled yourselves in the toils of enactments, still I will take it for granted that you differ from us in the freedom with which you can move forward towards the needs of the coming times; and I think perhaps I could not do better at the present moment than to use the opportunity offered me to take my old university as a text, and to draw from it and its history some few plain reflections which I hope may be practical and useful with regard to the conduct of universities. Allthough I understand that I have been especially invited by the medical faculty, I will take leave to treat only of general things, since the welfare of the medical faculty is bound up in that of the whole university.

The morphologists tell us we can learn much by studying the embryo, and something perhaps may be learned by looking back at this old University of Cambridge in the days of long ago—in the days when it too was a relatively young university. Things were very different then from what they are now. The dimly lighted streets or alleys in which the students lived were an emblem of the whole university. There was little outward show of glory then; there were no beautiful buildings, few books, and each student's duty was, in part, to listen to the lecture, to the reading of something which was written, but which he could not see with his own eyes. In spite of all these difficulties there were certain features of the university of that time which I trust I may say have been, with some little wavering here and there, maintained since, and which I cannot help thinking have contributed in very large measure to make it what I may venture to call it, a famous and great university.

One of the most striking features of the attitude of both students and teachers at that early time was that they recognised in the training of the university a preparation for practical life. There were at that time three main occupations in which learning was of practical use; and in correspondence to those three occupations there were established the three great faculties of the university—the faculty of theology, the faculty of law, and the faculty of medicine. And, if one reads what those men of old wrote concerning what they thought ought to be done in the university, one is very much impressed by the conviction which they had that the teaching should be an earnest preparation for practical life. If it soon became necessary to establish a fourth faculty, the faculty of arts, that was simply as a faculty preparatory to the others, as one supplying the first steps for and leading up towards the knowledge which should be of use in practical life; and it is worth noting that although they called that faculty the faculty of arts, and although the acquisition of the Latin language was one of the chief studies of that faculty, necessarily so because all the instruction which could be given was given in that tongue, among what they called the arts were the beginnings of the kind of knowledge which we now call science.

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[1] Address delivered at the Johns Hopkins University, Baltimore, October 11, 1897, by Dr. Michael Foster, Sec.R.S. (Reprinted from the *Bulletin* of the Johns Hopkins Hospital April.

Another feature of the university life of those early times was the very strong feeling that the work of the university consisted not in the mere acquisition of knowledge, but in the training of the mind. The amount of knowledge which they had for distribution was very limited; but they used that small stock of knowledge to the very best of their ability, as the means of awakening the minds of the students and training them for thinking and arriving at conclusions. This is seen even in what they called at that time examinations, though the word then had a very different meaning from what it has now; there were then no written examinations, there was not that demand on paper so characteristic of modern times, and that great necessity of modern civilisation, the waste-paper basket, was unknown. The examiners went quietly to work to ascertain in the most sure way whether a student had profited by what he had listened to. Instead of having two examiners for some hundreds of students, they appointed nine to each student; and these went in with him and out with him until they satisfied themselves that he knew something, and had gathered something from what had been told him. And then as a final test they put him on the "stool" and made him debate in public, the test being used in such a way as to bring out his stock of knowledge, and especially his power of using it and of showing that his mind had been trained at the same time that he had gathered in a certain number of facts.

There was another feature of the university which we sometimes find it difficult to realise: the spirit of inquiry was rife among them. At that time the ways of thinking were devious; but still within the limited circle in which they moved, along the only lines then open to them, the thinkers used their minds in the spirit of free inquiry. When one reflects upon the circumstances in which they worked, one cannot help realising that their long-drawn-out discussions were at bottom an expression of the love of inquiry, and that if they had had the advantages which we enjoy now, that which we call their subtlety would have broken out into discovery and invention.

Lastly, it was a feature of the university at that time that it was willing to take into its bosom any one who showed that he had any promise of benefiting by the instruction there given. It was an open home for all who wished for learning.

These are some of the features of the University of Cambridge in the olden times; and may we not, using them as a text, attempt to draw some conclusions as to what are the proper and essential functions of a university, and what ought to be some of its guiding principles? As I said just now, the knowledge which they possessed was extremely limited, the facts with which they had to deal were very few. What can we say of knowledge at the present time? May we not say, if theirs was too little for them, ours threatens to be too great for us; that we are entering upon an age in which the facts which have to be learned, and the various kinds of knowledge which have to be acquired are becoming too many for us? It is, or it may be perfectly true that one of the advantages of learning is that it enables the learner to learn more rapidly; but is not this true, notwithstanding that the increment of knowledge is increasing far more rapidly than the increment of the power to learn? Is it not a serious matter for consideration that the things that the university has to teach are rapidly becoming far too numerous for the learner to learn? Is it not true that we cannot do now as they did in those old times, teach the student all that was known? We are compelled to make a choice, we must teach to the student some things and omit to teach him others. That is a necessity which it seems to me is increasing as the years go on. Nevertheless that position is a cruel one; for it may be truly said that every kind of knowledge has a value of its own; each kind of knowledge has for the learner a value which can be given by no other kind, and he who fails to gain any one kind of knowledge is thereby a loser. For building up the student into the full and complete man, the best course would be to take in all the knowledge which can be offered by a university; but, as I said just now, a choice must be made, and the consideration of the principles which should guide the decision as to what should be chosen and what should be left, demands the most serious attention. Here I think we may venture to follow the example of the old university. Admitting that each kind of knowledge is particularly fitting for a particular calling, that for every particular calling in life there is a knowledge, or there are kinds of knowledge which are suited or fitted for that calling, and without which that calling can not be pursued with success, in the necessary choice which must be made between this study and that, is it not a wise course to take that which best serves the future calling of the student? I cannot but think that in this choice of which I am speaking, the arguments for what are sometimes called technical education are unanswerable; that one of the principles of most importance in determining the choice of the studies to be taken up by the student lies in the fitness of the study for giving him power in the calling which he proposes to adopt. We must, however, remember that the knowledge which is thus to be imparted to him must be not merely a knowledge of facts, but bring with it the power of thinking. If technical education is understood in this way, not as a mere accumulation of facts, not as the mere heaping of knowledge, but as the training of the mind in some particular kind of knowledge, the dangers, I venture to say, which some fear, will prove unreal, and it will be seen to be a true principle of university education.

There is another aspect in which we may look at university duties. May we not say that the tendency of modern civilisation is to smooth down individual differences, and that the whole tendency of the environment of man is to make each man increasingly more like his brother? There was a time when one could tell by the dress where a man came from; but this has become less and less easy, and it is not in dress alone, but in his very nature that man all over the world becomes more like his fellows. I myself during the short time I have been in this country have felt it more and more difficult to tell what are the differences between an American and an Englishman, and I trust that these differences are equally difficult to you. This may be a favourable aspect, but there is an unfavourable side to this continual influence of things about us. Mr. Francis Galton has shown that there is a great tendency in things to make men more and more alike in stature, and there seems a corresponding tendency to make men all alike in the stature of their minds. We seem tending in many ways to a monotonous mediocrity of intellect. This influence is especially strong among young people. I see for myself in the University of Cambridge that when one young man does one thing they all do it; they go astray like sheep, and they also go straight like sheep. Surely it ought to be a function of the university to counteract this tendency, and so to bring the influences of learning upon the young as to develop individual differences. That I take it is one of the most important functions which a university can exercise, but one which is not always kept in view in university enactments. Here I can speak of my own university, and in doing so can lay the blame for the present condition of things on the traditions of the past. I find in my own university discouragement for the development of individual power. Every lad who comes to the University of Cambridge is compelled to pass through the same examination, to know the same things to the same extent, whatever may be the nature of his mind. He must know a little Latin, a little Greek, a little mathematics, a little history and one or two other subjects. Each one who comes, whatever his previous history, must pass through this one gate; the whole university has been pushed through this one common gate. Now I know that this may be defended; it may be said, for instance, that it is a bad thing not to know Latin. I quite agree with that. I think it a very bad thing not to know Latin, but I also think it a very bad thing for a lad to be thrown into life, it may be to go through life, without any clear idea whatever of the fundamental laws which govern the phenomena of living things. It may be said that it is a bad thing not to know Greek; I agree with that. Not to know Greek is to my mind worse than not to know Latin, but I think also that it is a bad thing for a lad to go through life ignorant of the fundamental laws of chemical action. If you go along in that line of argument, you end by compelling a lad to know everything before he enters the university. If I had my way, and could wipe out the traditions of the past, I should vary that entrance examination. I should hold on to the old tradition of the university that it was ready to receive everybody who was likely to profit by its instructions. I should make the examination look, not backward as it does now, but forward, and should only insist that the lad must give such proofs of intelligence and industry as to lead to the hope that the years of university life would not be spent in vain. When the lad has really entered the university (at times he does not do so until he has spent two or even three years at the place in preparation, and sometimes goes away from the place without having really been admitted), it seems to me there should be a still wider scope for his studies. He has even now, it is true, an opportunity to take a degree in one or other of several branches of learning, but in each case he must follow out a particular schedule which has been laid down, and which compels him to walk along a particular path and no other. If he wishes, for example, to study mathematics with philosophy, he would find that he could not do so, for in the examinations mathematicians have nothing to do with philosophy, and philosophy nothing to do with mathematics; and so in other things. I venture to think that this is not a satisfactory condition of things, and that throughout the whole academic course there should be a freedom of the young mind to develop in the line in which it was intended to develop. When I urge this upon my friends, they all say "It is very good, but it is impossible; the examination machinery would become so complicated as to break down." But I would ask the question, Are examinations all in all? Were the examinations made for universities, or were universities made for examinations? I myself have no doubt about the answer. I trust that this new university, which can walk with freedom along new lines, will find some way of so arranging studies and examinations that the two will not conflict, and that anybody coming here will find that the particular gifts that have been given to him, and which it was intended should be developed, will meet their fullest expansion.

Lastly, there was another feature which the old university possessed and which I may also call an essential feature of a university, that is, the spirit of inquiry. No university can prosper as a university that not only does its best to favour special inquiries when these are started within it, but also in the whole course of its teaching develops, or strives to develop the spirit of inquiry. Now here again I fear that examinations—such at all events is my experience—are antagonistic to inquiry; and I would suggest that in arranging examinations one ought always to look ahead to see how far one can possibly order those examinations so as to favour the teaching which teaches in the real and true way, teaching by regarding each bit of learning as in itself an act of inquiry, and so as to favour in the highest degree actual inquiry when it is taken in hand. This of course is antagonistic to one function of examinations, namely, that of putting young men to compete against each other. You cannot so judge inquiries as to put the inquirers in any class list or in any order; the most you can do is to give an inquiry the stamp of approval of the university, a testimony that the inquiry has been carried out in a satisfactory way. It is true that in this way you lose that which is sometimes thought to be of great value, emulation between the scholars; but if you take away that kind of emulation you substitute for it another one far more strong and effective, that emulation that comes of striving with nature. I take it that the good which is done to a lad in starting him upon an inquiry is infinitely greater than any which can be gained by competition with his fellow students. Here I am glad to say a good word for my own university; for we have in a very quiet way, and unobserved, secured the adoption of an enactment which allows a lad to enter the university and obtain his degree and all which follows upon that without entering into a single examination. At the present moment it is possible for one, it is true under exceptional circumstances, to come to the University of Cambridge in England, and if he convinces a competent body of judges that he is a person likely to carry on inquiry in a successful manner he can enter the university as a student, and if he satisfies another body of men after a time that his inquiries have resulted in a real contribution to knowledge he can secure his degree. He can get that without ever having touched a written examination paper, and I am proud that we are able to offer that to the world; for it has happened again and again that a man who had real genius for a particular line of inquiry stumbled over the preliminary studies of which I have spoken, knocked at the door of our university in vain and was sent away. Now such an one would be admitted, and I venture to say that in the long run the university will be the gainer.

These, then, are some few thoughts concerning universities and their methods. I say I have purposely learned nothing about your enactments, but from what I know of your short past I feel confident that this university will in the future be conspicuous for progress. May I hope that it will carry on education along some of the lines which I have indicated to-day, and perhaps some day we in the old country may mend our ways after your pattern.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

The Calendar of the Glasgow and West of Scotland Technical College for the Session 1898–99 has just been issued.

Dr. R. A. Harper, of Lake Forest University, has been appointed to succeed Prof. C. R. Barnes in the chair of Botany in the University of Wisconsin.

Mr. H. R. M. Borland has been appointed junior assistant in the chemical and metallurgical department of the Bristol Merchant Venturers' Technical College.

Mr. Herbert Bolton, who for the last eight years has held the post of assistant keeper in the Manchester Museum, has just been appointed to the curatorship of the Bristol Museum.

We learn from the *American Naturalist* that Miss Phœbe Hearst has given a building for the School of Mines to the University of California. The building will be fully equipped at her expense.

Pfeiffer scholarships in science have been awarded, in connection with the Bedford College for Women, London, to Winifred E. Watts and Margaret Foster. The Reid fellowship, tenable at Bedford College, has been awarded to Margaret Lyal Dale.

Dr. Charles Hunter Stewart, who for the past ten years has acted as chief assistant in the Bacteriological Laboratory connected with the chair of Medical Jurisprudence and Public Health in Edinburgh University, has been appointed to the new professorship of Public Health and Sanitary Science at Edinburgh University.

The Science and Art Directory (revised to June 1898) has just reached us from the Department of Science and Art. In it is to be found, as usual, full information as to the regulations for establishing and conducting science and art schools and classes. Several minor alterations have been made in the regulations, and attention is called to these by the use of italic type.

SCIENTIFIC SERIALS.

Memoirs of the Novorossian (*Odessa*) *Society of Naturalists*, vol. xx.—On the origin of *limans* in the Government of Kherson, by M. Rudski. A "liman" is the local name for small bays on the sea-coast which are now separated from the sea by a bar, and offer very interesting peculiarities of structure and fauna. Various hypotheses having been made as to their modes of formation; these hypotheses are discussed, and new observations on the oscillations of the limans are given.—Notes on an excursion to Crimea, by the same. Chiefly on the geological changes going on in the coast-line.—Note on the meteorite of Savchinskoye, by R. Prendel (with a photograph of it).—Geological description of the Odessa district, by Prof. Sintsoff. A great deal of attention is paid to the hydrology of the region, and especially to the *limans* (with a geological map).—The Protozoa of the Haji-bei and Kuyalnik *limans*. No less than 130 species were found in the former, which contains a greater number of marine forms, and 75 in the latter.—Chemical researches in the Marmora Sea, on board the *Selanik*, by A. Lebedintseff. Preliminary report, from which it appears that the existence of bacteria producing sulphuretted hydrogen in the water and the mud of the Marmora Sea cannot be doubted.—On a globular syenite on the Bazavluk, by M. Sidorenko.—On the salinity of the Haji-bei and Kuyalnik *limans*, by Prof. Werigo.—Physical and chemical exploration of the Odessa *limans*, by A.